

## WHAT IS CLAIMED IS:

1. A magnetron sputtering apparatus comprising:

a vacuum chamber;

a target;

a cathode holding the target in the vacuum chamber;

a substrate;

an anode holding the substrate and being allocated above the cathode so as to face the substrate toward the target on the cathode;

a permanent magnet generating magnetic field and being allocated under the cathode; and

a rotation controller rotating the permanent magnet so as to pivot on almost a center of the target,

the permanent magnet further comprising:

a base;

a first permanent magnet being fixed on the base in the middle;

and

a second permanent magnet in a ring shape being fixed in a peripheral area of the base so as to surround the first permanent magnet,

wherein a magnetic polarity of the second permanent magnet is inverse with respect to a magnetic polarity of the first permanent magnet, and

wherein magnetic field strength of the second permanent magnet is weaker than magnetic field strength of the first permanent magnet, and

wherein the permanent magnet is in a cylindrical shape of which top portion is cut diagonally,

the magnetron sputtering apparatus is characterized in that the permanent magnet is perpendicularly allocated on a top of the axis of rotation of the rotation controller.

2. The magnetron sputtering apparatus in accordance with claim 1, wherein the first permanent magnet is fixed on the base in the middle with shifting a center axis of the first permanent magnet eccentrically with respect to a center of rotation of the permanent magnet, and

wherein the permanent magnet is either in a cylindrical shape of which top portion is cut diagonally or in a shape having different heights of which height steps down gradually from one end to the other

3. The magnetron sputtering apparatus in accordance with claim 1, the permanent magnet comprising:

a base;

a first permanent magnet being fixed on the base in the middle with shifting a center axis of the first permanent magnet eccentrically with respect to a center of rotation of the permanent magnet; and

a second permanent magnet in a ring shape being fixed in a peripheral area of the base so as to surround the first permanent magnet,

wherein a magnetic polarity of the second permanent magnet is inverse with respect to a magnetic polarity of the first permanent magnet, and

wherein magnetic field strength of the second permanent magnet is weaker than magnetic field strength of the first permanent magnet, and

wherein top surfaces of the first and second permanent magnets

are made to be flat horizontally and in parallel with the base respectively.

4. The magnetron sputtering apparatus in accordance with claim 1, wherein the permanent magnet is shaped into that top surfaces of the first and second permanent magnets are made to be flat horizontally and in parallel with the base respectively,

the magnetron sputtering apparatus is characterized in that the permanent magnet is allocated on a top of the axis of rotation of the rotation controller on a slant with respect to the axis of rotation of the rotation controller.

5. The magnetron sputtering apparatus in accordance with claim 1, wherein the first permanent magnet is fixed on the base in the middle with shifting a center axis of the first permanent magnet eccentrically with respect to a center of rotation of the permanent magnet; and

wherein the permanent magnet is shaped into that top surfaces of the first and second permanent magnets are made to be flat horizontally and in parallel with the base respectively,

the magnetron sputtering apparatus is characterized in that the permanent magnet is allocated on a top of the axis of rotation of the rotation controller on a slant with respect to the axis of rotation of the rotation controller.

6. A magnetron sputtering apparatus comprising:

a vacuum chamber;

a target;

a cathode holding the target in the vacuum chamber;

a substrate;

an anode holding the substrate and being allocated above the cathode so as to face the substrate toward the target on the cathode; and

a permanent magnet generating magnetic field and being allocated under the cathode,

the permanent magnet further comprising:

a first permanent magnet provided with a sliding mechanism for sliding the first permanent magnet horizontally with respect to the target, being allocated in the middle of the target; and

a second permanent magnet being fixed in a peripheral area of the target,

wherein a magnetic polarity of the second permanent magnet is inverse with respect to a magnetic polarity of the first permanent magnet, and

wherein magnetic field strength of the second permanent magnet is weaker than magnetic field strength of the first permanent magnet; and

wherein a top surface of the second permanent magnet is in parallel with a top surface of the first permanent magnet.